

# Influencing Public Perception of Sustainable Roadside Vegetation Management Strategies<sup>1</sup>

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## Abstract

Sustainably managed roadsides limit non-native turf grass and include meadows of native warm season grasses and flowering perennials, native shrubs, and trees. Implementation of sustainable strategies result in cost savings, better water quality and infiltration, increased diversity of insect life and benefits to the socioeconomic health of the state. Lacking an awareness of associated benefits, the public is often hesitant to accept sustainable, but less manicured roadsides, causing many Departments of Transportation to revert to traditional management regimes. This research assessed perception and determined that acceptance could be increased with an awareness of associated benefits. An Internet survey was administered to three groups of participants. A control group rated eleven roadside images from least to most desirable and completed a brief survey. An experimental group read a list of information about traditional and sustainable strategies of roadside vegetation management before rating the images and completing the survey. Another experimental group viewed a 6½ minute video that delivered the same information as the list, but engaged the respondent differently. This group then rated the images and completed the survey, as did the previous two groups. Among those who read the list, a significant change in perception occurred for three of the images when compared to those in the control group. Among those who viewed the video, a significant change in perception occurred for four of the images when compared to those in the control group. When all images were compared to the baseline image (mown turf), Delaware's current default vegetation management strategy, each response distribution was significantly different than that of mown turf. Respondents rated images of flowering meadows, meadow with a mown turf margin, turf with a wooded edge, shrubs and trees more desirable than mown turf and images with grassy meadows less desirable. When strategies were grouped according to similar attributes and compared to mown turf, respondents rated images with flowers (flowering meadows, shrubs and trees), and images with a mown turf margin more desirable than turf and grass meadows less desirable.

**Index words:** sustainability, sustainable landscapes, roadsides, rights-of-way, vegetation management, perception.

## Significance to the Nursery Industry

Sustainable roadside landscapes include meadows of native warm season grasses and/or flowering perennials, and masses of native shrubs and trees, and provide an opportunity for the nursery and landscape industry to explore a new aesthetic in highly visible landscapes. These types of landscapes offer environmentally sound alternatives to mown turf for corporate and large residential sites as well. Public resistance to naturalistic landscapes is possibly due to familiarity associated with traditional landscaping. If people were more familiar with sustainable landscape styles on the roadsides, they might be more likely to accept this aesthetic in other public and private landscapes. Interpretive information in the form of a bulleted list (Fig. 1) and an engaging video (<http://www.youtube.com/watch?v=C1Qqx96poxs>) were shown to reduce the desirability of mown-turf and increase the desirability of some types of sustainable landscapes. Therefore, if the nursery and landscape industry is willing to provide interpretive information to their customers, they may be able to promote a more environmentally sound aesthetic in managed landscapes.

## Introduction

Roads consume many miles of land and leave in their path vast tracts of rights-of-way that must be safely and efficiently managed and maintained in a manner that complies with state and federal regulations. With over 8 million acres of land in

the United States devoted to roadways and an additional 12 million more devoted to their rights-of-way (5), U.S. Departments of Transportation (DOTs) are positioned as leaders in stewardship of public land.

When managed sustainably, roadside vegetation can improve water quality and infiltration (7, 12), increase diversity of insect life (11, 15), contribute to cost savings (3, 7) and provide numerous safety benefits (3, 4, 6, 17, 18), while also benefiting the socioeconomic health of the state (2). (*To insure safety measures and proper visibility, careful attention must be paid to the placement and height of roadside vegetation during the design and implementation phases.*) Sustainably managed roadsides reduce the amount of non-native mown turf and include meadows of native warm season grasses and/or flowering perennials, and masses of native shrubs and trees. However, sustainable strategies only provide optimal cost savings and enhance environmental stewardship when implemented consistently. Many state DOTs maintain active ties to the public and political communities of their state and acquiesce to the wishes of these communities when appropriate. Lacking an awareness of the intrinsic values present in sustainable, but oftentimes less manicured roadsides, the public is often quick to criticize, with letters to the editor (9), popular press articles (1), or complaint phone calls (16), often prompting DOTs to revert to more traditional mowing regimes.

Many factors influence the public's reluctance to embrace sustainable landscape strategies. Native plantings may take two or more years to reach an attractive state, looking like a failure at first while plants are allocating energy towards establishment of healthy root systems. The ecological disturbance caused by development renders roadside rights-of-way harsh and inhospitable environments in which to grow, resulting in failed plantings unless care is taken to select adapted

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- Delaware has over 10,000 acres of roadside rights-of-way to maintain.
- In 2008 the Delaware Department of Transportation (DelDOT) spent over 3.4 million dollars mowing roadside rights-of-way.
- A change in roadside vegetation & management can reduce DelDOT's mowing budget by 50%.
- The clear zone within the rights-of-way must be kept free of trash, obstacles and tall vegetation.
- Mowers release hydrocarbons and carbon monoxide into the air we breathe.
- Changing the way we vegetate & manage the roadsides can make them beautiful and reflective of our local and native vegetation.
- Roadside mowing reduces plant species richness.
- Roadsides that aren't subject to the constant pressure of mowing are important for the conservation of biodiversity.
- Roadsides, allowed to grow as meadows, provide food for bees, our most important group of pollinators.
- In 2008 the US National Research Council identified urban stormwater as a leading source of water quality problems in the US.
- Water that runs off onto the roads picks up petroleum and roadway toxins before making its way into streams and ultimately our drinking water supply.
- Mixed roadside vegetation (a combination of indigenous herbaceous & woody plant materials) increases the infiltration of water and snowmelt into the soil and decreases runoff, far more efficiently than mown turf.
- Vegetation is the most cost effective and visually pleasing way to improve hydrology and control erosion.
- Plants can shield headlight glare from oncoming traffic
- Vegetation that does not require mowing eliminates the need to operate machinery on difficult and dangerous sites. Reduced mowing reduces the chance of workers being injured.
- Interesting roadside vegetation has been shown to reduce highway hypnosis and helps drivers stay awake and alert.
- Shrubs have been shown to absorb some of the kinetic energy from cars that run off the road.

**Fig. 1. Facts about roadside vegetation management practices presented to Group 2 prior to survey.**

species. And finally, many people are simply not used to the style of less manicured landscapes. Aesthetically, sustainable landscapes often represent a divergence from the traditional landscape expectation. Without knowledge of the intrinsic values associated with this atypical, and oftentimes, less manicured aesthetic, public response is frequently critical. In 1988, Koh espoused the virtues of an 'ecological aesthetic' in sustainable landscapes where aesthetics incorporate ecological quality as well as visual beauty (13). To achieve wider acceptance of this 'ecological aesthetic' in sustainable landscapes, research suggests intellectual engagement of the public is necessary to assist in their understanding and appreciation of the environment and an awareness of the ecological functions performed with sustainable landscapes (8, 19). Public awareness of the establishment process of sustainable plantings, and the benefits provided by a natural landscape, are crucial for public support (10). Without public support, DOTs are challenged in their move towards alternative, yet sustainable management strategies. Since it is important for DOTs to be able to respond to criticism and provide explanations of the environmental and economic benefits associated with sustainable management strategies, an understanding of which factors influence public perception is valuable.

The purpose of this study was to determine if an awareness of associated benefits could positively influence public perception of sustainable roadside vegetation management strategies when compared to mown turf. Additionally, this research sought to determine the efficacy of two different styles of educational intervention, a static written list and a brief, yet engaging video.

## Materials and Methods

In January 2010, an Internet survey was conducted on a population of adults (18+ yrs) from Delaware, Maryland, New Jersey and Pennsylvania. Survey Sampling International (SSI) (Shelton, CT) hosted the survey and provided the random sample population according to quotas set forth by the U.S. Census breaks. Eight thousand and seven invitations were emailed to a pool of SSI panelists requesting participation in the survey. Panelists who chose to participate clicked on a link provided and were randomly assigned to one of three groups (one control group and two experimental groups). The first 419 responses, representative of the population, accord-

ing to U.S. Census breaks for age, race, gender and income, were selected for the sample set. Participants in Group 1 (n = 147), the control, viewed an introductory screen that thanked them for taking the time to participate in the survey and provided general information about the project.

After viewing the introductory page, participants in Group 1 were led directly to the survey, which contained 11 photographic images depicting various models of roadside vegetation in Delaware. Images were chosen based on their ability to depict the desired roadside vegetation management strategies: mown turf, grassy meadow, meadow with a mown turf margin, meadow with native flowering perennials and stands of native shrubs and trees. Multiple images were chosen to represent the range of the outlined strategies. Careful attention was given to minimize external factors that could influence respondents' ratings such as, overcast skies, water views, trash, rainbows, et cetera. Respondents were asked to rate each image on a 7-point Likert scale for desirability, where 1 corresponded with least desirable, 4 with neutral and 7 with most desirable. Participants were also given the option of qualifying 'Why' they rated each image as they did by adding text in a blank box. Questions were posed to gather additional information regarding environmental and roadside concerns. Basic demographic information about age, gender, income, and level of education completed was also requested.

After reading the introductory page, participants in Group 2 (n = 139) were asked to read a one-page bulleted list of facts about current roadside vegetation management practices, in addition to information about cost effective, environmentally responsible, safe and sustainable regimes (Fig. 1). After reading the brief list, participants were asked to rate the same images, answer the additional environmental and roadside questions and answer the demographic questions (in the same manner as participants in Group 1)

After reading the introductory page, participants in Group 3 (n = 133) were asked to watch a short, fast paced, documentary-style video, that presented the same facts regarding current and potential roadside vegetation management practices as were presented in the written list; however, the information was presented in a much more entertaining and vibrant manner. After viewing the video, participants were asked to rate the images, answer the additional environmental

and roadside questions and answer the demographic questions (in the same manner as Groups 1 and 2).

*Data analysis.* Ratings for all images were summarized in frequency tables using Microsoft Excel (2007). A chi-square test for independence was used to evaluate the existence of a significant relationship between treatment (control, list, video) and the participant responses. The data was condensed to a 3-point Likert scale to de-emphasize degrees of desirability/undesirability and clarify whether respondents found the images desirable, neutral or undesirable. Respondents rating images as 1, 2 or 3 valued those images as undesirable. Respondents rating images as 4 indicated neutrality and respondents rating images as 5, 6 or 7 valued those images as desirable. Values were considered significant at a 0.05 or a 0.1 significance level. Computations were performed using JMP Software (JMP, 2008).

Two-group pair-wise comparisons (Minitab) were used to evaluate whether treatments (control, list or video) showed significant differences. In the two-group pair-wise comparisons, the list was compared to the video, the control was compared to the list and the control was compared to the video to determine an existence of significant differences. Chi-square (JMP) was used to analyze the extent and direction of those differences. In the chi-square test, the three groups were all contrasted against one another.

Additional chi-square tests were run contrasting images 2-11 with image 1 (mown-turf) the baseline, representing the current default roadside vegetation strategy in Delaware. These computations were performed using JMP software.

The final method of evaluation for the data was a set of chi-square tests contrasting mown-turf (image 1) with various categories of vegetation types, grouped according to their most similar attributes, and represented by the following images:

- Flowering meadows (images 2, 3 and 4)
- Warm season grass meadows (images 6 and 8)
- Shrubs and trees (images 5 and 10)
- Warm season grass with a mown margin (images 8 and 11)
- Various vegetation types with a mown margin (images 5, 8, 10 and 11)
- Various vegetation types containing flowers (images 2, 3, 4, 5 and 10)

These computations used JMP software.

## Results and Discussion

With this research, we sought to determine if an awareness of benefits could improve public perception of sustainable

roadside vegetation management strategies when compared to mown turf, Delaware's current default strategy. We also sought to determine the efficacy of two different styles of interpretive intervention, a static written list and a brief, yet engaging video.

This research revealed that the majority of respondents, with or without treatment, found strategies including shrubs and trees with a mown turf margin, and flowering perennial meadows to be their most preferred vegetation management strategy along roadsides. Additionally, when compared to mown turf, each of the other strategies were rated significantly different.

*Overall ratings for roadside images.* Over eighty percent of respondents surveyed found images with shrubs, trees and turf (image 10: 85%; image 5: 80.5%), and an image of a native flowering perennial meadow (image 2: 80.1%) as highly desirable (Table 1). These results were not surprising based on the results of *Delaware Speaks Out*, a 1999 statewide cooperative extension survey that revealed color and order as attributes necessary to gain public acceptance of sustainable roadside vegetation strategies (2).

Most respondents found images of mown turf with a tree edge (image 9: 65.2%) and a flowering meadow with a mown turf edge (image 3: 60.4%) as desirable. More respondents found a flowering perennial meadow of Goldenrod (*Solidago sp.*) and Thoroughwort (*Eupatorium hyssopifolium*) (image 4: 43.7%) desirable than found it neutral (28.6%) or undesirable (21.0%). This result was somewhat surprising based on the high desirability of the flowering perennial meadow represented in image 2 (80.1%). Qualitative data revealed many respondents found the meadow composition in image 4 'weedy' or 'messy', possibly due to the looser growth habit of the two species than that of the Black Eyed Susans (*Rudbeckia sp.*) (image 2). Additionally, nineteen respondents (across all groups) indicated they found this scene undesirable because of concern for allergies. Interestingly, goldenrod does not cause allergies. This is a common misconception because goldenrod blooms at the same time as the wind pollinated ragweed (*Ambrosia artemisifolia*), which does cause allergies (14). This response represents an opportunity for interpretation that might help people accept flowering goldenrod meadows more readily. The mown turf infield (image 1) was rated as desirable (37.9%) or neutral (36.5%) by an almost equal number of respondents.

Respondents found a cool season grass meadow with a mown turf edge (image 11: 34.1%) neutral. These results were surprising based on the results of a 2005 University of Delaware *Comprehensive Mail Survey*, which found turf,

**Table 1. Frequencies of responses for desirability for 11 roadside vegetation management strategies.**

Image	Vegetation strategy	Desirable	Neutral	Undesirable
1	Neatly mown turf	37.9%	36.5%	25.5%
2	Flowering meadow	80.1%	12.6%	7.2%
3	Flowering meadow; mown turf margin	60.4%	17.9%	21.8%
4	Flowering meadow	43.7%	28.6%	21.0%
5	Shrubs and trees; mown turf margin	80.5%	13.6%	6.0%
6	Grass meadow	34.6%	23.6%	41.8%
7	Un-mown turf	10.3%	24.1%	65.6%
8	Grass meadow; mown turf margin	25.3%	35.8%	38.9%
9	Mown turf; tree edge	65.2%	24.1%	10.8%
10	Shrubs and trees; mown turf margin	85.5%	10.7%	3.8%
11	Tall turf; mown turf margin	32.4%	34.1%	33.4%

**Table 2. Response mean and standard deviations for all strategies listed from most to least desirable.**

Image	Vegetation strategy	Mean (STDV)
10	Shrubs and trees; mown turf margin	5.80 (1.21)
5	Shrubs and trees; mown turf margin	5.49 (1.23)
2	Flowering meadow	5.48 (1.31)
9	Mown turf; tree edge	4.97 (1.42)
3	Flowering meadow; mown turf margin	4.73 (1.51)
4	Flowering meadow	4.19 (1.51)
1	Mown turf	4.11 (1.63)
11	Tall turf; mown turf margin	3.92 (1.36)
6	Grass meadow	3.75 (1.71)
8	Grass meadow; mown turf margin	3.70 (1.42)
7	Un-mown turf	2.89 (1.44)

released from routine mowing while maintaining a crisp mown edge to be equal in desirability to a fully mown turf infield (2). One possible explanation for this discrepancy may be that the image used in the 2010 survey featured a grass margin that had not been freshly mown, portraying a somewhat shaggy appearance, while the image used in the 2005 survey featured a released turf meadow with a freshly mown edge, clearly portraying an appearance of maintenance and order. This explanation is supported by 24 comments referring to this image as ‘messy/un-kept’ and by 22 comments referring to this image as ‘unfinished’. In contrast, in the 2005 survey 16 respondents referred to turf with a mown turf edge as ‘well-kept’ while 3 respondents commented that the image was ‘unfinished’ or less than desirable in some way, and no respondents referred to the image as ‘messy/un-kept’ (2).

Strategies that many found undesirable include those with un-mown turf (image 7: 65.6%), warm season grass meadow (image 6: 41.8%) and a warm season grass meadow with a mown turf edge (image: 8: 38.9%). Qualitative data revealed many respondents found the scenes boring, messy or had a negative response to the tan warm season grasses shown in the fall.

When ranked in order of response mean for desirability, the image of freshly mown turf ranked seventh out of eleven images, trailed by un-mown turf, or grass meadows: with or without a mown turf edge (Table 2). The largest standard deviation, indicating a wide variety of responses occurred for image 6, a warm-season grass meadow. Interestingly, more respondents in the control group than in either educational group, commented that they found this scene pretty/natural, had good fall color or was low maintenance and good for the environment. Although the highest frequency of respondents rated this image undesirable (41.8%), a higher number of respondents rated it desirable (34.6%) than neutral (23.6%). So, although this strategy ranked below mown-turf as a desirable vegetation strategy, these results indicate the public’s potential willingness to accept this as a form of vegetation along roadside rights-of-way. Similar frequency responses for image 11, a tall turf meadow with a mown margin, reported 33.4% of respondents rated this strategy undesirable, 34.1% rated it neutral and 32.4% rated it desirable. So, if overwhelming majorities are either neutral or agreeable to this strategy (66.5%) than are disagreeable (33.4%), DOTs could use this strategy to save money and benefit the environment without the risk of intense scrutiny and criticism.

*Comparison of interpretive intervention strategies.* Since a chi-square test of responses (based on a 3-point Likert-scale)

reported significantly different response distributions based on whether respondents received an interpretive intervention (list or video) compared to the control for (images of) five of the eleven strategies, the possible source of these significant differences can be explored. This test confirms different response distributions for five of the eleven strategies viewed at a 0.1 significance level: neatly mown turf (image 1: p-value 0.079), a meadow mix of warm season grass and native flowering perennials with a mown turf edge (image 3: p-value 0.006), a native flowering perennial meadow (image 4: p-value 0.065), a stand of native shrubs & trees with a mown turf edge (image 5: p-value 0.044) and un-kept un-mown turf (image 7: p-value 0.005) (Table 3).

To understand which treatment method caused the most changes in perception, a two-group pair-wise comparison was used. This test contrasted the control group (no interpretation) against each of the two experimental groups (list and video). The results showed that when compared to the control group, the group who first read the written list of benefits associated with sustainable roadside vegetation management strategies, found three of the eleven strategies (images) different in terms of desirability. Significant changes in perception occurred for strategies (images) that showed a meadow mix of native warm season grass and native flowering perennials (image 3: p-value 0.015), a stand of native shrubs and trees with a mown turf edge (image 5: p-value 0.096), and a un-kept un-mown turf edge (image 7: p-value 0.001) (Table 4). The results of this test confirmed the hypothesis that interpretation, in the form of a written list, caused a change in perception, three out of eleven times.

When compared to the control group, the group who first viewed the video, showed the most changes in perception. Significant shifts occurred for strategies (images) of: a neatly mown turf infield (image 1: p-value 0.059); a meadow mix of warm season grass and native flowering perennials (image 3: p-value 0.002); a native flowering perennial meadow (image 4: p-value 0.014); and, a stand of native shrubs and trees with a mown turf edge (image 5: p-value 0.013) (Table 4). By comparing expected and observed counts, we can see that respondents without interpretation were less likely to rate mown-turf as undesirable and respondents who watched the video were less likely to rate mown-turf as desirable (image 1) (Table 5). Respondents without interpretation were more

**Table 3. Chi-square test of responses for treatment group (control, list, video) comparison, based on a 3-point Likert Scale.**

Image	Vegetation strategy	Chi-square value	P-value
1	Neatly mown turf	8.370	0.079* <sup>z</sup>
2	Flowering meadow	5.701	0.223
3	Flowering meadow; mown turf margin	14.313	0.006** <sup>y</sup>
4	Flowering meadow	8.836	0.065*
5	Shrubs and trees; mown turf margin	9.778	0.044**
6	Grass meadow	2.017	0.733
7	Un-mown turf	14.835	0.005**
8	Grass meadow; mown turf margin	1.200	0.878
9	Mown turf; tree edge	2.567	0.633
10	Shrubs and trees; mown turf margin	1.764	0.779
11	Tall turf; mown turf margin	1.585	0.811

<sup>z</sup>Indicates significantly different response distributions at a 0.1 significance level.

<sup>y</sup>Indicates significantly different response distributions at a 0.05 significance level.

**Table 4. Two-group pair-wise comparison: List-Video, Control-List, Control-Video, indicating significant differences among treatments.**

Image	List-Video p-value	Control-List p-value	Control-Video p-value
1	0.132	0.181	0.059 <sup>z</sup>
2	0.182	0.871	0.182
3	0.376	0.015 <sup>**</sup>	0.002 <sup>**y</sup>
4	0.494	0.182	0.014 <sup>**</sup>
5	0.701	0.096 <sup>*</sup>	0.013 <sup>**</sup>
6	0.480	0.884	0.140
7	0.027 <sup>**</sup>	0.001 <sup>**</sup>	0.239
8	0.816	0.553	0.904
9	0.939	0.479	0.322
10	0.736	0.855	0.420
11	0.633	0.626	0.780

<sup>z</sup>Indicates significance at a 0.1 significance level

<sup>y</sup>Indicates significantly different response distributions at a 0.05 significance level.

likely to find the flowering meadow with mown-turf margin undesirable and less likely to find it desirable. Respondents who watched the video were less likely to find the flowering meadow with mown-turf margin undesirable and more likely to find it desirable (image 3) (Table 6). Respondents without interpretation were less likely to find the more naturalistic flowering meadow desirable and respondents who watched the video were more likely to find it desirable (image 4) (Table 7). This test confirmed the hypothesis that interpretation, in the form of a video, caused a change in perception for some of the images. The two- group pair-wise comparison also confirmed the hypothesis that an engaging interpretative video is slightly more effective than a static written list as a method of information delivery (Table 4).

This research revealed that the majority of respondents, with or without treatment, found strategies including shrubs and trees with a mown turf margin, and flowering perennial meadows to be their most preferred vegetation management strategy along roadsides.

In response to the second objective, an investigation of whether an engaging video is a more effective tool for altering perception than a static written list, the results suggest that an engaging interpretative video is somewhat more effective

**Table 5. Chi-square test for image 1 (mown turf).**

Rating	Control	List	Video	Total
1	29	40	38	107
Undesirable	37.54 1.943 <sup>z</sup>	35.50 0.571	33.96 0.480	
2	55	43	55	153
Neutral	53.68 0.033	50.76 1.185	48.57 0.852	
3	63	56	40	159
Desirable	55.78 0.934	52.75 0.201	50.47 2.172 <sup>*</sup>	
Total	147	139	133	419

Chi-square = 8.370; DF = 4; P-value = 0.079<sup>\*</sup>

<sup>z</sup>Indicates a significant contribution to the chi-square. Expected counts are printed below observed counts. Chi-square contributions are printed below expected counts.

**Table 6. Chi-square test for image 3 (flowering meadow with a mown turf margin).**

Rating	Control	List	Video	Total
1	46	26	19	91
Undesirable	31.93 6.204 <sup>**</sup>	30.19 0.581	28.89 3.383 <sup>*</sup>	
2	25	28	22	75
Neutral	26.31 0.065	24.88 0.391	23.81 0.137	
3	76	85	92	253
Desirable	88.76 1.835 <sup>*</sup>	83.93 0.014	80.31 1.702 <sup>*</sup>	
Total	147	139	133	419

Chi-square =14.313; DF = 4; P-value = 0.006<sup>\*</sup>

<sup>\*</sup>Indicates a significant contribution to the chi-square. Expected counts are printed below observed counts. Chi-square contributions are printed below expected counts.

than a static written list. Additionally, informational interventions, in either form (list or video) may be an effective tool for changing public opinion about sustainable roadside vegetation management strategies. After viewing a 6½ minute video informing participants of the risks and expenses associated with traditional vegetation management strategies and the benefits associated with sustainable strategies, respondents were significantly more accepting of sustainable strategies including: a mixed meadow, a flowering perennial meadow and a stand of native shrubs and trees, and significantly less accepting of neatly mown turf. After reading a one-page list detailing similar information, respondents were significantly more accepting of sustainable strategies illustrated by a flowering perennial meadow and stands of native shrubs and trees, and significantly less accepting of un-mown turf. Qualitative data indicated that respondents who did not receive either educational intervention were more likely to view mown turf as ‘pretty’ and were less aware of the maintenance costs and environmental concerns associated with turf than those who received an informational intervention. Respondents without an intervention were also less likely to identify flowering meadows as low maintenance. Respon-

**Table 7. Chi-square test for image 4 (flowering meadow).**

Rating	Control	List	Video	Total
1	47	36	33	116
Undesirable	40.70 0.976	38.48 0.160	36.82 0.397	
2	49	40	31	120
Neutral	42.10 1.131	39.81 0.001	38.09 1.320	
3	51	63	69	183
Desirable	64.20 2.715 <sup>z</sup>	60.71 0.086	58.09 2.050 <sup>*</sup>	
Total	147	139	133	419

Chi-square =8.836; DF = 4; P-value = 0.065

<sup>z</sup>Indicates a significant contribution to the chi-square. Expected counts are printed below observed counts. Chi-square contributions are printed below expected counts.

dents who viewed the video however were more likely to identify the environmental benefits of native shrubs and trees. These results could attest to the efficacy of the video, and the images it contained to convey the message that sustainable landscapes need not appear wild or un-kept. Interestingly, requests for a copy of the video for use as a teaching tool came from pre-survey pilot viewings, a participant in the survey and during a post survey research presentation. It is also important to note, however, respondents who received some form of information in general (list or video) rated four images depicting sustainable practices significantly more desirable and one image depicting an unsustainable strategy significantly less desirable.

*Additional survey results.* Additional qualitative data revealed important information regarding respondents' attitudes about the environment and their opinions on roadside enhancement. Ninety six percent of those surveyed reported having concerns about the current state of the environment. Many respondents expressed concern for the negative environmental ramifications brought about by the mowing regime required of turfgrass, Delaware's current default vegetation management strategy. When asked to rank which attribute respondents considered most important in roadside vegetation management decisions: cost effectiveness, environmental stewardship or beauty, the majority of respondents (46.3%) placed environmental stewardship at the top of the list, and the least number of respondents (13.4%) put it at the bottom. This result was quite surprising given the current economic climate. Another surprising result amid an economic recession revealed that 85% of those surveyed agreed that DOTs should spend money on roadside enhancement. This percentage shows a drastic increase since the 1999 Cooperative Extension survey, *Delaware Speaks Out*, in which only 62% expressed support for spending tax dollars to beautify Delaware's roadways (2).

When compared to mown-turf, sustainable strategies including flowering perennial meadows, a mixed meadow of native flowering perennials and warm-season grasses, stands of native shrubs and trees and a mown-turf edge were found to be more desirable. Solid stands of warm season grasses with or without a mown margin, tall cool season turf with a mown margin and unmown turf, in other words tan grass and/or untidy grass, were found to be less desirable than fully mown turf. Subjective comments indicated that the undesirability was attributable to brown or dead-looking grass (a misunderstanding of the growth cycle of warm season grasses), a feeling that DelDOT was not maintaining the roadside sufficiently, or a lack of neatness or order. Mown turf was most frequently described as 'boring' by survey respondents.

When compared to mown turf, sustainable strategies with flowers, native shrubs, trees and a mown turf edge were found to be more desirable. After reading a one page list of information associated with sustainable and traditional roadside vegetation management strategies:

- Respondents were more accepting of the sustainable roadside management strategies illustrated with a flowering meadow and stands of native shrubs and trees
  - Respondents were less accepting of unmown turf
- After viewing a 6½ minute video of information associated with sustainable and traditional roadside vegetation management strategies:

- Respondents were more accepting of the sustainable roadside management strategies illustrated with two flowering meadows and a stand of native shrubs and trees
  - Respondents were less accepting of neatly mown turf
- Respondents with some form of interpretation (list or video) in general rated images depicting sustainable practices as more desirable.

Limitations in this study included the use of photographs as representation for sustainable landscape strategies. Despite a reminder at the beginning of the survey that participants' opinions of the roadsides, not the roads themselves were desired, negative comments about guardrails, houses, utility wires and the like were reflected in their ratings. Future studies could be improved by editing images to remove extraneous influences.

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